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ABSTRACT

The Ohio legislature adopted a Bill calling for an evaluation of the performance of academic programs of state-assisted institutions of higher education. The selection of criteria utilized in evaluation is critical. A list of criterion statements was compiled from materials on hand, from accrediting agency information, and out of the experiences and inquiries of the committee. This study attempts to develop criteria other than the two standard types: "cost-benefit" and "enrollment-driven." The model developed requires the identification of program objectives and relating those objectives to the expectations of the public to be served. A list of 33 criteria statements was developed by the committee and distributed to all department chairmen at the University of Toledo and to 1,116 students receiving degrees in June 1975. The responses were scaled and factor analysis used to determine the relationships among variables. The nine factors identified are: program size, understanding the program, description and objectives, academic standards, cost efficiency, innovative programs, employability, supportive nature of the program, public relations, and nonteaching work of the faculty. Comparison is made between department chairmen and students on these factors; of the scores for each factor for the department chairmen and students by college; and of scores for each factor for graduates and department chairmen by level of program. (JMF)

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Criteria Warranted for Evaluation of Academic Programs at The University of Toledo

There is every indication that the evaluation of academic programs both from internal and external sources will receive increasing attention in the future. There are already indications that state agencies are beginning the process of program inventory which is a basic step in this review. It may be that in the future systematic review will be conducted each year as budgets are prepared.

The Ohio legislature in the recent session adopted language in House Bill 155 which states clearly that the General Assembly is interested in having the Board of Regents evaluate the performance of academic programs of state assisted institutions of higher education.

The selection of criteria utilized in evaluation is critical. A list of criterion statements thought to be useful in evaluation of academic programs was compiled by a committee selected jointly by the Deans of the several colleges and the Office of Academic Affairs at The University of Toledo. {Appendix I} These statements were developed from materials on hand, from accrediting agency information and out of the experiences and inquiries of the committee.

Criteria used currently tend to fall into the category of "cost benefit" or "enrollment driven" models. A cost benefit model is one in which the economic advantage attributable to the program is the same as the benefit or service offered by the University through the particular program. An enrollment driven model assumes that a particular funding

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base is determined and as the program increases or decreases in {full time equivalent student} size, the funding tied to the program is also changed. It is assumed, in the enrollment driven model, that if it costs X dollars to educate n FTE students, it will cost 2X dollars to educate 2n FTE students.

Criteria of this nature are important and are required by an important funding agency of The University of Toledo — The State of Ohio. The intent of this study was to attempt to develop other criteria that are also important in program evaluation.

The study was undertaken with the knowledge that other colleges and universities have been at work on this or similar problems in the immediate past. Among several has been the effort of those working through the National Center for Higher Education Management Systems {NCHEMS} at Western Interstate Commission of Higher Education {WICHE}. The excellent work reported under the title Outcome Measures and Procedures Manual, Field Review Edition May 1975 is certainly a model which many will want to consider. {Micek, 1975}

An additional notable evaluation system was produced under the direction of C. Robert Pace {1975}. The system makes it possible to evaluate the effectiveness of an academic program or an entire college in terms of information about the development, progress and attainment of students and the educational experiences processes and context which affect student development. The information supplied by use of the kit proposes a reasonable baseline against which performance and characteristics may be compared.

The NCHEMS model proposed offers three major areas of evaluation; those being student growth and development measurements and procedures, new knowledge and art forms measurements and procedures, and community development and service measurements and procedures. The strengths of the NCHEMS model and that of Pace's Higher Education Measurement and Evaluation Kit are well known to Institutional Research personnel. They are worthy of considerable attention on the part of any institution seeking to develop its own system of evaluation of academic programs.

Interest at The University of Toledo was developed through an understanding that the academic community of the University would have an opportunity to build its own concept of criteria warranted for the evaluation of its programs. Once these had been established the University would take on the task of comparing the criteria with those developed at other selected campuses. The approach was taken deliberately in order to elicit interest and support on the part of students and faculty.

Those experienced in evaluation understand that the word criterion is . . . "usually associated with the selection process; we talk for instance about how well college admissions tests predict the criterion grade point average or how well employment tests predict criteria of satisfactory job performance." {Anderson, Ball, Murphy, et. al., 1975}

The construction of criteria in a proper context is to achieve proper application of those criteria in the evaluation of academic programs. This requires careful identification of objectives for the

programs and the near complete assurance that those objectives are congruent with the expectations of the public to be served by the programs.

Procedure

The list of 33 criterion statements was developed by the committee and distributed to all Department Chairmen at The University of Toledo and to the 1,116 students receiving degrees in June 1975. A department chairman responded for each program offered by his department at each of the degree levels. The College of Business Administration, for example offers a BBA and MBA in Marketing, thus the Chairman of the Marketing Department responded to the criteria at both the Baccalaureate and Masters levels. The students were asked to indicate their degree levels on the questionnaire.

A total of 140 responses were received from the department chairmen and 272 (24.4%) from the graduates. The response rate for the graduates varied from 13.3% for those receiving law degrees and 14.4% for those receiving associate degrees to 28.4% for those receiving masters degrees. Sixty-three percent of the graduates who responded received a Baccalaureate degree. There was no follow up campaign to attempt to elicit a greater response, and no inducement was offered for responding to the instrument.

Comparison of Response

The responses were scaled with "extreme importance" equal to 1 and "no importance" equal to 5 — thus, the lower the mean score the more

important the respondents as a group rated the criterion.

Among the department chairmen, question 19 {see appendix I} "service level for which the graduates are qualified" was the most important criterion, and number 12, "extent to which the program meets the stated objectives," was the second most important criterion.

Among the students, question 26, "the extent to which students perceive the faculty as being supportive of student needs," was considered the most important. The second most important criterion, in the students' view, was the "service level for which the graduates were qualified."

The mean responses for the two groups were ranked from high to low and Spearman's coefficient of rank correlation was determined to be .811. The null hypothesis that no correlation exists between the two response groups was statistically tested at the 5% level, and rejected. The conclusion is that a positive relationship exists between the ratings of the criteria for the two response groups.

A Factor Analytic Solution

A correlation matrix was developed which showed relationships among the 33 criterion statements for the combined responses of the department chairmen and the spring 1975 graduates. With so many variables involved it was difficult to obtain any kind of visual picture of the inter-relationships of the data. Therefore it was desirable to determine what latent factors or dimensions were involved in the data. A method for determining these relationships among variables is through factor analysis. Factor analysis can be used to reduce a large number of variables into a few interpretable constructs. The 33 criterion statements represent the variables, and a factor is a resolution of a set of

these variables in terms of new categories called factors. A method for highlighting the relationship within factors is to rotate the coordinate axis in n space. This rotation does not change any of the relationships, but tends to make the results more interpretable. The most widely applied rotation technique and the one utilized in this analysis is the varimax rotation, in which the principle is to simplify the factors rather than the variables.

Application of Factor Analysis

It was possible with nine factors to explain 57.8% of the variation within the 33 criterion statements. The major thrust or focus of the 33 criterion statements can be obtained with the identification of the 9 factors instead of 33. For each factor criterion statement combination a factor loading is determined. These loadings are the correlations between each factor and the criterion statements.

The literature on factor analysis offers no standard for determining which of the factor loadings are contributing significantly to the explanation of variation and which are not. These standards are usually determined by the researchers. A correlation between a criterion statement and a factor of $r \geq .50$ was considered important for this study, unless there was no correlation in the factor greater than .50, in which case the largest correlation in the factor was used. The factor names were determined by a judgmental evaluation of important variables within each factor. This is the standard procedure where factor analytic techniques are used. Table 1 presents a summary

of the criterion statement — factor combinations, a brief statement indicating the nature of the criterion statement, and a statement indicative of the combination of significant criterion statements within each factor. For example, criterion statement 32 refers to the number of majors in a particular program (see Appendix 1) and variable 33 to the number of graduates from the program. In Factor I, there were no other factor criterion statement combinations where the correlation exceeded 0.50. Since both variable 32 and 33 refer to the size of the program, Factor I was named Program Size. In similar manner , the important criterion statement — factor combinations were determined and the factor name derived from the most significant criterion statements in that factor.

Analysis of Responses

It is possible with factor analysis to determine, for each respondent, a factor score on each of the factors and then to treat these factor scores as random variables. It is therefore possible to perform an analysis of variance, t-test, or correlation analysis, or any other procedure that requires interval scaled data. This was done and the results follow.

Comparison Between Department Chairmen and Students on the 9 Factors

Table 2 shows the mean factor scores for the department chairmen and for the June 1975 graduates and the ranking of each of these nine factors within the two groups. The coefficient of rank correlation between the two groups is .725, which is sufficient association to

Table 1

Summary of Major Variables Within

Factors for Combined Faculty and Staff

Factor Number	Factor Name	Variable Number	Variable Names
1	Program Size	32	Number of Majors
		33	Number of Graduates
2	Understanding Program Description and Objectives	1	Class Scheduling
		11	Updated and accurate program information
		12	Achieves Stated Objectives
		20	Public awareness of program requirements
		25	Clearly defined objectives.
3	Academic Standards	3	Acceptance into Graduate School
		6	Accreditation and Professional Standards
		7	Achievement of graduates on national exams
4	Cost Efficiency	21	Positive cost benefit relationships

Table 1
{con't}

Summary of Major Variables Within
Factors for Combined Faculty and Staff

Factor Number	Factor Name	Variable Number	Variable Names
4	Cost Efficiency	22	Number of student credit hours generated.
5	Innovative program	9	Innovative program
6	Employability	4	Graduates able to obtain employment.
7	Supportive Nature of the program	16	Depth in Study
		17	Supportive of other Univ. Programs
		28	Survey of knowledge area.
8	Public Relations	29	Program increases public awareness
		30	Encourage high academic Standards
9	Non-teaching work of Faculty	13	Research, Publication and consulting done by faculty.

reject the null hypothesis of no correlation at the 5% level of significance. Based on this test it was concluded that the two groups showed consistency in their assessment of the nine factors. However, it is interesting to note the extremes. Program Size is the least significant factor among students and the most significant among department chairmen. Academic Standards was the most important factor among students, but least important factor among faculty. It appears that there was disagreement with the extreme points, but general agreement with the middle factors.

There is a significant difference in the mean factor scores of the two groups for all factors except II and VII using a t-test 5% level of significance. The department chairmen view the factors of Program Size, Supportive Nature of the Program, and Non-Teaching Work of the Faculty as significantly more important than the graduates. The graduates view the factors of Academic Standards, Cost Efficiency, Innovative Programs, Employability, and Public Relations as significantly more important than the department chairmen. The mean factor scores for the factors, Understanding Program Description and Objectives and Supportive Nature of the Program, were not found to differ significantly.

Comparison of the Factor Scores for Each Factor by College for the Department Chairmen and Students

An analysis of variance (ANOVA) was performed on the factor scores by college for responses of the department chairmen and the graduates. The results are summarized in Table 3 for the department chairmen.

Table

Mean Factor Scores and Factor

Ranks, t Statistic

Factor Name and Number	Mean Student Score	Rank Among Students	Mean Faculty Score	Rank Among Faculty	t Statistics
1. Program Size	0.186	9	-0.374	1	-6.22*
2. Understanding Program Description and Objectives	-0.043	5	0.082	4	1.37
3. Academic Standards	-0.231	1	0.443	9	8.47*
4. Cost Efficiency	-0.143	2	0.283	7	4.99*
5. Innovative Program	-0.095	3	0.184	6	3.03*
6. Employability	-0.091	4	0.177	5	3.38*
7. Supportive Nature of Program	0.035	6	-0.074	3	-1.39
8. Public Relations	0.168	8	0.342	8	-6.98*
9. Non-teaching Work of Faculty	0.073	7	-0.144	2	-3.02*

*Significant at the 5% level of significance

The instructional staff at The University of Toledo is assigned to one of seven colleges noted at the bottom of Table 3. There is only one program in the College of Law and only two in the College of Pharmacy. These colleges were excluded from this portion of the analysis due to this very small number of responses. The Scheffe Test for post hoc comparisons was used to investigate the difference between pairs of means where a significant F value was found. The Scheffe Test is a powerful procedure for comparing sample means and tends to be conservative in guarding against a Type I error. As an example of the conservative nature of the test for Factors VI and IX of department chairmen responses (Table 3 the ANOVA indicated at least one significant difference between a pair of sample means, but the Scheffe Test did not detect where these differences existed. In fact, these differences were still not detectable when the level of significance for the Scheffe Test was increased from 5% to 10%.

For the factor, "Understanding the Program Description and Objectives," the F statistic is significant, indicating that a significant difference in mean factor scores exists between at least one pair of colleges and the Scheffe Test indicated there were six pairs of significant differences in sample means. The department chairmen in the University Community and Technical College (UCATC) and those in the College of Education did not weight this factor with as much importance as those in the Colleges of Engineering and Arts and Sciences. It appears that those in the former colleges, who tend to use instructional objectives, rated this factor important, whereas those in

Table

Comparison of Means by College for

Each of the 9 Factors

and the Post Hoc Identification of

Significant Differences

Factor	F Statistics	Comparative Results
1. Program Size	2.345	
2. Understanding Program Description and Objectives	12.367*	{1,7},{7,4},{4,3} {1,4},{3,1},{4,2}
3. Academic Standards	13.33 *	{1,7},{2,7},{4,7}, {3,7}
4. Cost Efficiency	14.403*	{7,1},{4,1},{7,3}, {4,3}
5. Innovative Program	1.561	
6. Employability	3.138*	
7. Supportive Nature of Program	6.069*	{1,7},{1,2},{3,7}, {3,2},{4,7},{4,2}
8. Public Relation	2.079	
9. Non-teaching work of Faculty	2.594*	

*$p \leq 0.05$

Critical Value = 2.44

Group Code

1. Arts and Sciences
2. Bus. Administration
3. Education
4. Engineering
5. Law
6. Pharmacy
7. U.C.A.T.C. {University Community and Tech. College}

the latter two colleges, who do not tend to use objectives as often rated it as less important. Apparently the College of Business falls somewhere in the middle, not associating with either group.

In Factor III, Academic Standards, there is a significant difference between the mean factor scores of UCATC department chairmen and the department chairmen of each of the other colleges. This is perhaps a manifestation of the philosophical position of UCATC. The objective of an Associate Degree Program might be conceptualized as seeking to give students a job oriented skill or making the student more employable. There is little concern in preparing the student for graduate education, whereas this is a concern to the baccalaureate colleges. The colleges of Arts and Sciences and Education tended to view the Cost Efficiency factor, Factor IV, as important, whereas UCATC and the College of Engineering tended to find this factor unimportant. Perhaps this reaction is tied to current enrollment trends. Those colleges with decreasing enrollments tend to have the factor of cost efficiency on their minds, more than those not facing enrollment problems.

The examination of the results of the post hoc tests on Factor VII, {The Supportive Nature of the Program} tend to support the contention of the cost efficiency discussion. The Colleges of Education and Arts and Sciences do not find this factor important, whereas the College of Engineering and UCATC do find this factor important.

Responses of the graduates were also analyzed by college comparing the factor scores for each of the nine factors. There were

four factors on which at least one significant difference between pairs of means was noted, but the Scheffe Test detected a significant difference (at the 10% level) only on Factor VII (The Supportive Nature of the Program). The Factor scores were significantly different for this factor between the Colleges of Arts and Sciences and Pharmacy. This is perhaps due to the educational philosophies involved. Students in Arts and Sciences may be concerned with developing a broad base of knowledge, intellectual acumen and entering graduate school. Those students in the College of Pharmacy tended to be job oriented.

Comparison of Factor Scores for Each Factor by Level of Program for Graduates and Department Chairmen

An ANOVA procedure was performed comparing factor scores by the level at which the degree was awarded, i.e., Associate, Masters, Doctoral, etc. There were no pairs of means where the factor scores differ significantly, using the Scheffe Test, for the students in comparing nine factors. For the department chairmen, a significant difference between at least a pair of means was obtained on five factors. The Scheffe Test detected a significant difference between pairs of means on four of the factors. Department chairmen perceived a difference between the Associate degree and the Baccalaureate, Masters and the Doctoral degrees for the factor Academic Standards. Since all of the Associate degrees at the University of Toledo are awarded at UCATC, these findings are congruent with earlier results. The Associate degree graduates was found to differ significantly from each of the other four degree graduates regarding the factor of Cost Efficiency.

This factor was the most important to those at the Associate level.

Factor VII (Supportive Nature of the Program) was found to differ significantly when the Associate and Doctoral Graduates are compared. Those at the Doctoral level found this factor significantly more important than those at the Associate level. Factor IX (Non-Teaching Work of the Faculty) was found to differ significantly between the Doctoral, Education Specialist and the other three levels.

Conclusions

The following is a summary of the major conclusions reached in the analysis.

a. Nearly 60% of the variability within the 33 criterion statements (Appendix 1) can be explained by nine factors using a statistical technique called factor analysis. These nine factors are shown in Table 1.

b. There was general consistency in the rankings in terms of importance of the nine factors between graduates and departmental chairmen, but they did disagree on the most important and least important factors. (The Size of the Program was the least important factor to graduates and the most important to department chairmen.) Academic Standards was the most important factor among students, but the least important among faculty. There was general agreement between the two groups on the middle ranks however.

c. The department chairmen viewed the factors of Program Size, Supportive Nature of the Program, and the Non-Teaching Work of Faculty

as significantly more important than the graduates. The graduates viewed the factors of Academic Standards, Cost Efficiency, Innovative Programs, Employability, and Public Relations as significantly more important than department chairmen.

d. The factor, Understanding the Program Description and Objectives, was not viewed by department chairmen in the Colleges of Education and UCATC with as much importance as by those in the Colleges of Arts and Sciences and Engineering.

e. The department chairmen's responses for Factor III, Academic Standards, were found to differ significantly between UCATC and each of the other colleges.

f. The department chairmen in the Colleges of Arts and Sciences and Education viewed Factor IV, Cost Efficiency, as significantly more important than those at UCATC and in the College of Engineering.

The warranting of these criteria and their coalescence into the nine identified categories as the result of the application of factor analysis makes it possible for us to move ahead with the identification of specific outcomes, of programs and the selection of appropriate measurements of those outcomes.

We expect this to be done with 10 to 15 programs during the summer of 1976. We will proceed to carry forward a pilot evaluation of 10-15 academic programs in the fall of 1976 using criteria developed in this study.

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